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INCORPORATION OF RAINFALL RATES FROM LAND AND SHIPBOARD BASED RADARS IN MESOSCALE DATA ANALYSIS AND INITIALIZATION SCHEMES

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LONG TERM GOALS: To obtain high resolution initial conditions in coastal regions for the Navy's NORAPS and COAMPS models from shipboard radar observations.

OBJECTIVES: To develop a numerical scheme to incorporate meteorological parameters such as rainfall rates from shipboard and land based radars into data initialization and analysis schemes of NORAPS and COAMPS. This work is supported by ONR Marine Meteorology

APPROACH: The SPY-1 radar currently is not programmed to observe weather, but is restricted to military targets, and the data are classified. Martin Marietta is planning to determine the operational feasibility of using the Navy's SPY-1 radars for providing meteorological parameters in real-time operations. This does not involve developing techniques to fuse the data into the Navy's data analyses and initialization systems.. These systems are used to generate data sets that can be used as initial conditions by prognostic numerical models and as input for diagnostic models. Since NOAA's Nexrad and the Navy's Spy-1 are similar in their characteristics for meteorological purposes, initially we use data from nexrad to develop techniques to fuse radar data from into the Navy's mesoscale analysis systems. Once these systems are successfully developed, they will be tested with SPY-1 radar products using shipboard analysis systems developed for nested version of COAMPS. For the coarse networks, cumulus parameterization inversion techniques will be used to specify diabatic heat sources at various levels. For the fine grid network, rainfall rates from observations are compared with model produced rates. Difference between these two rates are converted into heating rates and will be used to force the

model to accept the observed rates for two to three hours to create the divergence fields appropriate to the observed precipitation rates.

WORK COMPLETED: Data from radar network along the East coast of US is collected the months of February, March, June and July months of 1996. The data is converted into rainfall rates using mathematical algorithm provided by National severe Storms Laboratory. These rainfall rates are compared with SSM/I observed rainfall rates and with those measured by rainguages. When rainfall is light to moderate, differences of rainfall rates obtained from all three measuring techniques are significant. However for very heavy rainfall cases the radar measured rainfall rates are significantly higher than those obtained from satellites and rainguages. Rainfall rates obtained from radar reflectivities during March 14-18, 1996 are converted into diabatic heating rates and are averaged to 9km resolution of the COAMPS model selected for the numerical experiment. These diabatic rates are distributed vertically using Kuo cumulus parameterization scheme. The COAMPS model is integrated using a combination of the heating rates obtained from radar data and model computed values as heat sources. The results after three hours of integration shows that the use of rainfall rates from radar reflectivities can provide valuable high resolution dynamic and thermodynamic fields.

RELATED PROJECTS: ONR/NRL supported Accelerated Research Initiative (ARI) on coastal meteorology. The basic objectives of this project are to understand the structure, dynamics and physics of mesoscale circulations in coastal regions. Some of the numerical techniques developed under this program will be used in fulfilling the objectives of this project.

REFERENCES: Ruggiero, F.H., K. Sashegyi, R.V. Madala and S. Raman: Diabatic initialization of stratiform precipitation for a mesoscale model. Accepted for publication in J. of Applied Meteorology, 1996